

The Structure and Comparative Study of the Dynamic Financial Condition Index

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Keywords: FCI, TVP-FAVAR, dynamic weight, financial market

Abstract: The financial condition index combines the information of multiple financial variables, which can reflect the overall operation of the financial market more comprehensively and intuitively than a single index. The TVP-FAVAR model based on dynamic weight measures the real-time FCI in China, overcomes the single defect of fixed selection index and coefficient, allows parameters and predictive variables to have time-variation, can adapt to the sudden change of economic structure, so that FCI has the function of financial market liquidity indicator. Empirical research shows that based on the dynamic weight of TVP-FAVAR model construction of financial condition index on the one hand can better reflect the actual financial market tightness, on the other hand can for the future macroeconomic indicators, especially the inflation rate is more accurate prediction, to provide important reference for the formulation and implementation of monetary policy in China.

1. Introduction

China in the past 40 years of reform and opening up has made remarkable achievements. Financial reform has been deepened and financial development has entered a new era. But at the same time, China's monetary policy is also facing more complex uncertainties and challenges from home and abroad, and these internal and external challenges make China's economy facing considerable external risks and downward pressure. Under this background construction contains extensive information of China's financial condition index (FCI), on the one hand can help financial institutions and investors better grasp the current overall financial development situation, prevent market implied uncertainty, on the other hand can judge the future economic situation and formulate the corresponding macroeconomic policy provide reference.

In view of this, this paper will study the following two questions: how to build a dynamic weight FCI index with real-time? Which model and method of FCI index can accurately reflect the tightness of China's financial market conditions, and play a better role in predicting the macro economy?

The following study is arranged as follows: the second part is the literature review and review; the third part is the construction of theoretical model; the fourth part is the construction and treatment of indicators; the fifth part is empirical inspection; and final part is conclusion and policy suggestion.

2. Literature Review

The concept, formerly known as the Monetary Condition Index (MCI), was first proposed by the Bank of Canada in the late 1980s. Ball (1999) used the MCI to examine the optimal monetary policy under an open economy. However, the index variable selected by the MCI index is single and does not apply to developing countries where government intervention is important in the market. Therefore, Goodhart and Hofmann (2001) added two variables, real estate price and equity index price, including the asset price, to the original MCI, and determined the weight of each variable by the vector autoregressive pulse response method to obtain the new FCI index. This article is considered the opening work of FCI. Later, the study of FCI is mainly developed along two dimensions: adding the new FCI index and improving the FCI measurement method. From the construction of new indicators, Guichard and Turner (2008) studied and analyzed the financial status index of the United States through loan standards, high-yield bonds, real exchange rate and stock market value. Hatzius et al (2010) analyzed financial indicators from non-neoclassical, neoclassical and credit communication channels, and expanded factors such as household wealth, corporate debt interest margin and credit status on the basis of the original FCI variables. In the construction of FCI measurement method, the academic circle is also constantly expanding. Goodhart and Hoffman (2001) used the method of VAR pulse response to calculate the weight of the FCI index coefficient. Different from the former, Matheson (2012) measured the macro economy with the help of the FCI index constructed by the dynamic factor model, and found that FCI can provide information on the stability of financial conditions and play a predictive role in the macro economy.

Domestic FCI development started later, from the domestic study of scholars on FCI, Bu Yong and Zhou Qing (2004) according to China's national conditions to the money supply the influence of inflation and economic growth channels to the FCI, through a single equation method estimate IS curve and Phillips curve get the weight of the variables, become an earlier study FCI index of Chinese scholars. Ba Shusong and Han Mingrui (2011) innovatively considered the important role of bank credit in China's monetary policy, incorporated the total credit index into the design, and constructed an FCI based on SVAR pulse response model under the condition of considering the current relationship between various variables. Guo Ye and Yang Jiao (2012) used VAR and SVAR models respectively to construct the FCI of China's financial condition index and verified the good correlation and forerunner between it and CPI, but also exposed the strong "model dependence" and "data dependence" of static weight FCI.

Combing literature found that although domestic scholars can combine China's national conditions to expand the FCI, but most of the existing research or comply with foreign early research paradigm, there are the following three deficiencies: first, most of the FCI construction model itself constraints, can include fewer macro variables, so there is a shortage of macroeconomic information. Second, most of the existing FCI studied adopts the static weight model, and the variable weight cannot adapt to the changes of the economic situation during the sample period. The non-temporal variation of parameters leads to the "data dependency" and "model dependency" mentioned in the literature review above, making it not have the real-time and accuracy that should be a reference index of monetary policy.

In view of this, the DMA-TVP-FAVAR model is constructed by referring to the measurement method proposed by Koop and Korobilis (2013). Compared with the traditional static weight model, the addition of TVP and DMA makes the FCI index overcome the single defect of selecting the index and coefficients, allowing the parameters and predictor variables to have time variability, and can adapt to the sudden change of economic structure.

Compared with the existing relevant literature, the marginal contribution of this paper is reflected in: first, in the selection of data, increase the data sample size, and the innovative exchange rate

expectation (NDF) into the variable indicators, further enrich the macroeconomic information included in the financial condition index. Second, build a series of dynamic weight models including FAVAR, FA-TVP-VAR, TVP-FAVAR, including DMA and DMS, to fill the gap in the system construction of dynamic weight FCI index in China, so that it can have the potential to become a reference index of monetary policy.

3. The Selection and Treatment of Indicators

This paper draws on the previous research on the selection of indicators, combined with China's national conditions, a total of 16 macroeconomic indicators are selected to form the variables of FCI index, and divides the indicators into monetary policy variables, external impact variables and internal impact variables into three categories from the perspective of impact sources affecting financial stability. Monetary policy variables include five indicators, such as interest rate, money supply and social financing scale.

For the model explained variables, this paper selects CPI, GDP, unemployment rate, M2 and interest rate as the model observation methods of the Koop and Korobilis (Table 2). Quarterly data is selected for all the above indicators, and the sample interval is selected from the second quarter of 2002 to the second quarter of 2019. The above data are all obtained from the wind database.

Table 1 Constructs the Indicator Variables of the Financial Condition Index

Variable classes	Variable name	variable declaration	frequency
Monetary policy variables	CHIBOR 7	The 7-day inter-bank lending weighted rate	quarter
	CHIBOR 30	The 30-day inter-bank lending-weighted rate	quarter
	CHIBOR 90	The 90-day inter-bank lending-weighted rate	quarter
	M 2	Broad money supply M 2: log sequential growth rate	quarter
	TSF	Scale of social financing: log-log sequential growth rate	quarter
External impact variable	FER	Foreign exchange reserves: a log-over year-over-year growth rate	quarter
	Oil	Global spot crude oil prices: log-year-over-year growth rate	quarter
	FIV	Foreign direct investment: log-log sequential growth rate	quarter
	USDRMB	USD spot exchange rate against renminbi	quarter
	CFETS	Real effective exchange rate index of RMB	quarter
	NDF	Expected us dollar exchange rate against the renminbi	quarter
Internal impact variable	ZCI	Shanghai Composite Index: log-log sequential growth rate	quarter
	SCI	Shen Zhen Component Index: log sequential growth rate	quarter
	CGB 1	Yield to maturity: 1 year	quarter
	HPI	National housing climate index: log sequential	quarter
	FGI	Industrial enterprises: inventory of finished goods: log-sequential	quarter
Observable macroeconomic variables	CPI	The Consumer price index saw a year-on-year growth rate	quarter
	GDP	Year-on-year GDP growth rate	quarter
	EMPLO	The registered year-on-year growth rate of the urban unemployment rate	quarter
	M 2	Broad currency circulation M2: sequential growth rate	quarter
	RATE	The 90-day Inter-bank Offering Rate	quarter

4. Empirical Test

By knowledge from the nature of FCI, FCI takes zero as the dividing line. When the data is greater than zero, it indicates that the financial situation is relatively loose and the overall macro economy is good; When the data is less than zero, the financial situation tends to be tense and the macro economy faces downside risks.

Figure 1 shows the static FCI index simply using all 16 financial variables without any model selection or model averaging. Estimated results from the FAVAR, FA-TVP-FAVAR, and TVP-FAVAR models differ very little. Figure 1 also plotted the principal component (Principal Component) estimates for the 16 financial variables, which are similar in overall trends between their estimated results and any FAVAR based estimates, but with significant differences in the specific results. TVP-FAVAR utilizes a time-varying covariance matrix and VAR dynamic factor models, while PCA utilizes a homovariance static factor model, which also partly explains why there are such obvious differences between PCA and FAVARs.

According to the FCI estimates, the financial conditions index was negative from the second quarter to the end of 2002 to the end of 2003, from the second quarter of 2002 to early 2003, but from the beginning of 2003, the FCI began to show an upward trend and turned negative to positive in early 2004. The overall tightening financial situation at the beginning was related to the severe flood of SARS in China from 2002 to early 2003, affecting the overall macro economy. Since the middle of 2003, the SARS virus began to be effectively controlled. In addition, because the RMB exchange rate was pegged to the US dollar, with the continuous depreciation of the US dollar, the actual RMB exchange rate depreciated and promoted the development of export economy. The performance of the FCI index was consistent with the real economic environment. The FCI turned in mid-2004 and fell to bottom out until early 2006. From the time, in 2004 began to face of rising prices and overheating macroeconomic people's bank to raise interest rates, and raise interest rates after the financial situation tightening again, with the arrival of the 2006 Chinese stock market "bull market", China's financial condition index also rebounded, and continued until the beginning of 2008 peak at 0.7. However, with the collapse of the "subprime mortgage crisis" in the US by Lehman Brothers in September 2008 and then spread to the world, China's financial market tightened again, and the financial conditions index also turned negative and reached the lowest point of -1.6, which shows the great impact of the 2008 financial crisis on the financial market. Subsequently, the Chinese government immediately introduced a series of expansionary fiscal and monetary policies, including the "four trillion yuan" plan to stimulate the economy, and also maintained the order of the financial market and the confidence of investors. Therefore, the FCI index began to recover and began to turn positive at the end of 2009. This good momentum continued until its peak in late 2011. With 2012, 2013 and 2014, China's GDP growth rate was below 8% for three consecutive years, China's economy has bid farewell to the previous economic growth of more than 10%, and the economic growth showed a new normal. During this period, the FCI index fluctuated and fell, but the overall situation remained positive, and the financial situation was relatively loose. China's financial conditions tightened, and the FCI fell back to zero. Immediately to the central in 2016 stock market lessons to prevent financial risk formally put forward "three to one drop a fill", guide the money to entity, make the financial return to duty, and achieved initial results, the financial market began to recover, but with the trade war, made already downward pressure economy, financial condition index also close to zero. By comparing the trend of FCI index, it is basically consistent with the actual trend of China's financial market, so it can predict China's financial situation to some extent.

Figure 2 shows the FCI exponents estimated dynamically using different methods after the addition of dynamic model selection and dynamic model averaging. The FCI values estimated by TVP-FAVAR (DMS) and FA-TVP-FAVAR (DMS) are significantly different from the other FCI values. The FCI index predicted by the TVP-FAVAR (DMS) and FA-TVP-FAVAR (DMS) methods are very similar and have greater fluctuations than the FCI index predicted by other methods, especially during the 2008 economic crisis. The FCI results obtained by other dynamic methods were generally consistent. Figure 3 shows the static weight of the FCI index and join the DMA and DMS dynamic weight comparison between the FCI, the overall trend of the difference is not big, but the dynamic method of the FCI fluctuation frequency is faster, more sensitive to financial changes, to some extent can

more accurately capture the subtle changes in the financial market.

Figures 1 to 3 present a comparison of the financial condition index constructed by a range of different methods, at which stage we do not indicate whether any FCI is better or worse than the other FCI. The key findings we highlight are that while they are similar to each other in many ways, they present substantial differences. These differences were most significant when we compared estimates based on TVP-FAVAR, FA-TVP-VAR, and FAVAR with conventional estimates. The lowest magnitude was the difference between the TVP-FAVAR (all variables) and FAVAR (all variables) methods, indicating that temporal changes in parameters play only a small role in the model.

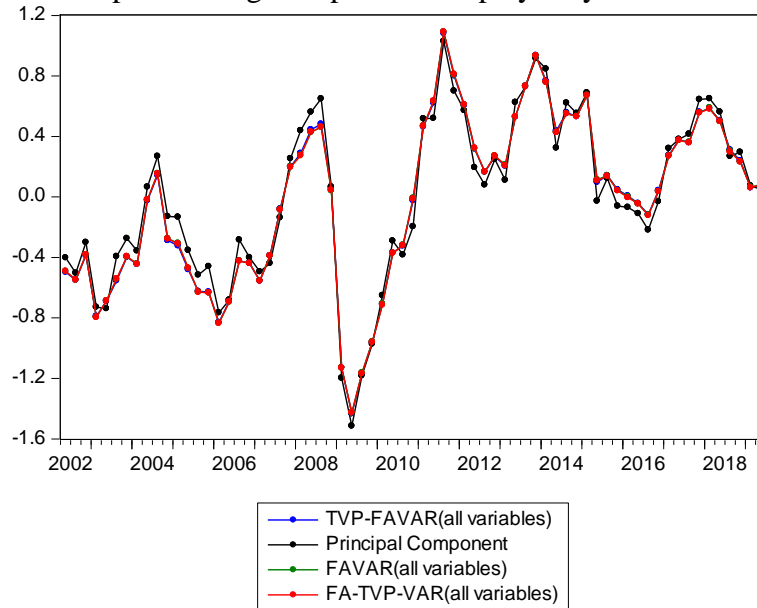


Figure 1 FCIs constructed by different methods of heteroscedasticity factor enhancement of VAR models

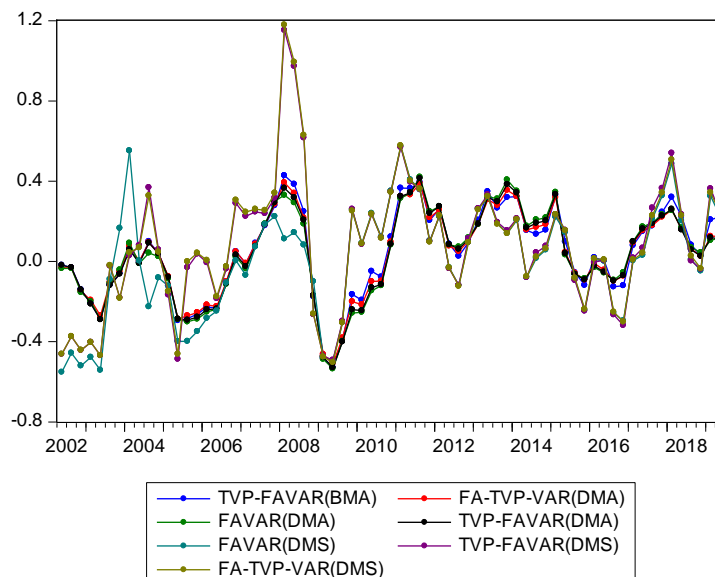


Figure 2 Introduces the estimated FCIs under DMA, D M A, DMS and BMA

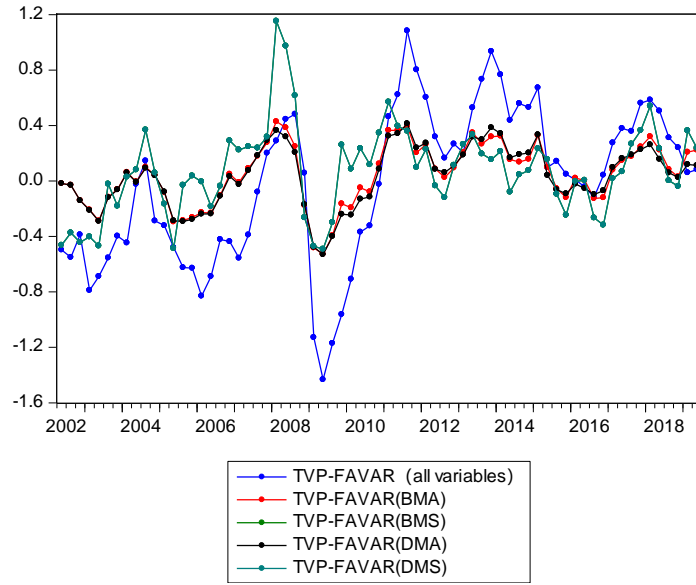


Figure 3 Comparison of the FCI index constructed from the different forms of the TVP-FAVAR models

To gain a clearer understanding of the role that DMA plays in estimating FCI, we provide Figures 4 and 5, which clarify the number of variables selected when we performed DMA or DMS on TVP-FAVAR. Where Figure 4 calculates the expected number of variables used to extract the FCI at each time point. If we represent the number of variables that load the FCI under the model, then we compute the expected value of the number of variables used by the DMA for each time period as n_j

$$E(n_t^{DMA}) = \left(\sum_{j=1}^J \pi_{t,j} \times n_j \right) - 1$$

Figure 4 shows that the number of variables used by the DMA to construct the FCI index consistently declined from the beginning of the sample until 2003. Subsequently, the number of variables began to rise slowly until the end of the sample interval. In addition to the seven-day inter-bank lending variable, the FCI always includes about three to six financial variables.

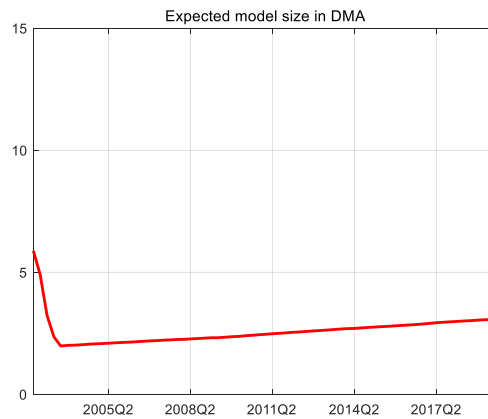


Figure 4 The mean number of variables extracted at each epoch by the FCI index constructed based on the DMA-TVP-FAVAR model.

Figure 5 details the size of the weights taken by each variable during the DMA process. The

numbers in each panel in this figure are the total probability of the DMA being attached to the model containing the variables specified in the heading on the figure. The indicator with the highest probability at each time point is selected by the DMS into the build FCI. It is worth noting that some variables, such as the expected exchange rate (NDF), Shanghai Composite index (FER) and foreign exchange reserves (ZCI), are initially added by DMA to the FCI. The variable with the largest contribution to FCI is foreign direct investment (FIV), since the second quarter of 2008, the probability of FIV is always greater than 0.5 and it is always on the rise.

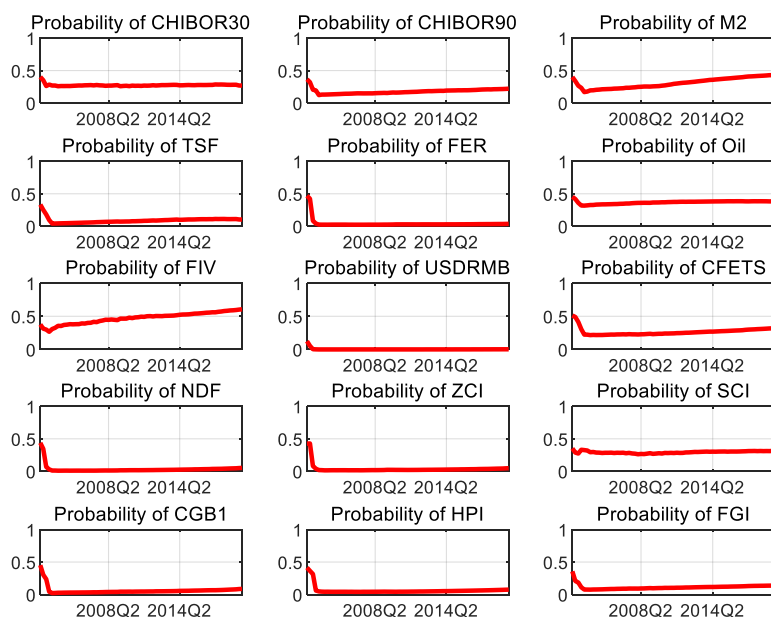


Figure 5 Contains the time-varying probabilities of the final FCI for each of the 19 financial variables

5. Conclusion and Policy Recommendations

According to the current domestic financial condition index (FCI), based on many static models based on traditional VAR and reduced total demand model, the parameters and variables of FCI lack time variation, and cannot well reflect the current situation of China's financial market. This paper refers to the measurement method of Koop and Korobilis (2013), studies the construction of different forms of FCI, the elastic reflection of financial market conditions and macroeconomic prediction ability, and provides reference and inspiration for policy authorities to develop time-varying financial condition index.

The results show that the TVP-FAVAR model and its variant FA-TVP-VAR model of the financial condition index can better reflect the actual tightness of China's financial market, on the other hand, the future macroeconomic indicators, especially the inflation rate, are accurate to provide an important reference for the formulation and implementation of monetary policy in China.

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